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Effects of Diethylstilbestrol in Fathead Minnows: Part 2. Concentrations in Water and Tissues

Diethylstilbestrol (DES), a synthetic nonsteroidal estrogen, was once widely prescribed to prevent miscarriages, and was used as a growth promoter in feed for beef and poultry production. After it was determined that DES caused significant adverse effects in the offspring of mothers exposed to the compound, its use was limited in both pharmaceutical and veterinarian applications. However, since DES might still be used as a growth enhancer in aquaculture in some countries, it is important to determine possible endocrine impacts it could have on fish, as well as its potential to accumulate in tissues that might result in exposure of human consumers to DES. A fathead minnow (FHM) experiment was conducted in which adult fish were exposed to DES at 1.0, 10 and 100 ng/L for 96 h followed by a 96 h depuration period. The direct measurement of DES in tank water and fish tissue samples at ng/L levels proved challenging. The analytical method used was developed on a single quadrupole liquid chromatograph/mass spectrometer (LC/MS). DES was measured on a daily basis using LC/MS with isocratic (tank water) or gradient (fish tissue extract) HPLC elution of a reversed phase column and atmospheric pressure photo-ionization detection. The fish tissue residues were determined by analyzing samples which were extracted using acetonitrile and homogenization techniques. The analytical quantitation limits were 75 ng/L and 2 ng/g for water and tissue samples, respectively. The predicted BCF (bioconcentration factor) of DES based on its log K_{ow} (octanol-water partition coefficient) is 5000, while our experimental BCF was determined to be in the range of 50-100. This suggests a low risk of accumulating substantial amounts of DES in fish tissue.

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